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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SILVERBROOK RESEARCH PTY LTD 393 DARLING STREET BALMAIN, NSW 2041 AUSTRALIA			CHOI, HAN S	
			ART UNIT	PAPER NUMBER
			2853	

DATE MAILED: 02/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/773,189

Applicant(s)

SILVERBROOK, KIA

Examiner

Han S. Choi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-54 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 12/16/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means," "said," and "comprises" should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

2. The abstract of the disclosure is objected to because the abstract is two paragraphs and includes the word "comprises" in line 1. As stated above, the abstract should be limited to one paragraph and "comprises" should be changed accordingly. Correction is required. See MPEP § 608.01(b).

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir.

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1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-54 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 5-20, 23-39, 42, and 44-54 of copending Application No. 10/728,779 in view of Dunn (US Pat. 4,982,199).

Silverbrook in copending Application No. 10/728,779 discloses the elements of the claimed invention except for the bubble forming liquid being at least 10, 40, and 60 degrees C cooler than its boiling point after the gas bubble collapses before the heater subsequently activates.

Dunn teaches in [Col. 3, Lines 41-64] a prewarming pulse that increases the ink in the nozzle to 60 degrees Centigrade, but no more than the boiling point 100 degrees Centigrade. Therefore, the temperature of the ink can be at least 40°C cooler than the boiling point, furthermore, Dunn teaches that the ink temperature can be raised less than 60°C in [Col. 3, Lines 61-64], therefore at least 60°C cooler than the boiling point can be met. Dunn does not explicitly mention the prewarming occurring after the gas bubble collapses but Dunn teaches in [Col. 2, Lines 31-38] "the rapid growth of the bubble expelling the ink above the bubble out a printing orifice." The prewarming pulse

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to heat the ink occurs subsequent to ejection of the ink. Hence, it is obvious that the prewarming pulse occurs after the collapse of the bubble.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the different temperatures of prewarming taught by Dunn with the printhead of Silverbrook in the copending application for the purpose of varying the volume of the droplet size.

This is a provisional obviousness-type double patenting rejection.

Claim Objections

5. Claim 9, 28, and 45 are objected to because of the following informalities: "said part" lacks antecedent basis from Claims 1 and 19. Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 9, 28, and 45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim language is unclear and contradictory. The claim language states that there is a comparison in energy required to heat a heating element of a received supply of liquid at ambient temperature to a temperature for ejection to a volume of the same received supply equal to the volume of the same ejecting drop from an ambient

temperature to a boiling point. The subjects being compared are exactly the same from the claim language. One cannot have a lesser energy requirement than the other. The claim language should be written in a clear and concise manner.

In the specification, the applicant discloses "the ambient temperature may be less, if for example, the room temperature is lower, or if the ink entering the printhead is refrigerated", which does not support the claim language because if the ambient temperature is less then it would require a higher energy level to heat the liquid to boiling. Therefore, the examiner suggests changing the claim language to distinguish the different subject matter being compared to.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836).

Kubby discloses the basic elements of the claimed invention referring to claims 1-3, 5, 9, 19-21, 24, 28, 38, 40-42, and 45. Kubby teaches a plurality of nozzles on a printhead and adapted for supply with an ejectable liquid in [Col. 1, Lines 5-10]. A heater corresponding to each of the nozzles respectively, the heater having at least one

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heater element configured for thermal contact with a bubble forming liquid in [Col. 2, lines 24-33]. The heat energy of an ejected drop differs from the heat energy of an equivalent replacement drop in [Col. 2, Lines 11-17] (every time a drop is ejected the drop will carry more heat than its replacement). However, Kubby does not teach the heater element being heated to a temperature above the boiling point of the bubble forming a gas bubble that causes the ejection of a drop of the ejectable liquid from the nozzle. Kubby does not teach electrical energy required to eject the drop. Kubby does not teach an energy required to heat the heating element to cause ejection of an ink drop being less than the energy required to heat a volume of ejectable liquid equal to the volume of the ejected ink drop, from an ambient temperature to the boiling point. Kubby does not teach the temperature of the bubble forming liquid being at least 10, 40, or 60 degrees C cooler than its boiling point after the gas bubble collapses and before the heater subsequently activates. Kubby does not explicitly teach the bubble forming liquid and the ejectable liquid from a common body of liquid.

Dunn teaches in [Col. 3, Lines 41-64] a prewarming pulse that increases the ink in the nozzle to 60 degrees Centigrade, but no more than the boiling point 100 degrees Centigrade. Therefore, the temperature of the ink can be at least 40°C cooler than the boiling point, furthermore, Dunn teaches that the ink temperature can be raised less than 60°C in [Col. 3, Lines 61-64], therefore at least 60°C cooler than the boiling point can be met. Dunn does not explicitly mention the prewarming occurring after the gas bubble collapses but Dunn teaches in [Col. 2, Lines 31-38] "the rapid growth of the bubble expelling the ink above the bubble out a printing orifice." The prewarming pulse

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to heat the ink occurs subsequent to ejection of the ink. Hence, it is obvious that the prewarming pulse occurs after the collapse of the bubble. Dunn teaches the bubble forming liquid and the ejectable liquid common to each other in [Col. 2, Lines 31-38] (the bubble is created from the same ink as the ink that is ejected. Silverbrook teaches for most liquids the critical temperature for an ejection temperature is substantially above the boiling point in [Col. 14, Lines 14-18]. Silverbrook teaches a given electrical energy required to eject a certain volume of an ink drop with a different heat energy than an equal volume of a supply ink drop with a different heat energy in [Col. 4, Lines 59-65]. Silverbrook teaches in [Col. 4, Lines 59-65] comprising a thermally activated liquid ink printing head being characterized by the energy required to eject a drop of ink being less than the energy required to raise the temperature of the received supply of ink of a volume equal to the volume of said ink drop above the ambient ink temperature to below ejection temperature. Ejection temperature is referred to in Claims 1, 18, and 34 as the temperature above boiling point. Therefore, "below ejection temperature" would include the boiling point.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Dunn and Silverbrook into the printhead of Kubby for the purpose of controlling the temperature of the ink to eject a desirable volume of ink and to drive the resistor with sufficient voltage to have correct bubble formation and to eject ink by heating the same ink with a resistor to create a bubble, and dissipating the full amount of the active power in the printed ink itself in [Col. 38, Lines 24-31].

Kubby discloses elements of the claimed invention referring to claims 11, 18, 23, 26, 30, 37, 47, and 54.

Kubby teaches the heater element in the form of a cantilever beam [18] in [Col. 3, Lines 53-55] shown in Figs. 1 and 2. Kubby teaches the heater element [20a and 20b] causing a gas bubble to be formed on both sides of the heater element [20a and 20b] in [Col. 4, Lines 59-63]. Kubby teaches a heater element [20a or 20b] that is substantially covered by a protective coating substantially to all sides, which are seamless in [Col. 4, Lines 32-50] shown in Fig. 4. Kubby teaches a configuration to support the bubble forming liquid in thermal contact with each said heater element, and to support the ejectable liquid adjacent each nozzle in [Col. 3, Lines 13-24] shown in Fig. 2.

10. Claims 4, 10, 22, 29, 39, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Feinn et al. (US Pat. 6,543,879).

Kubby in view of Dunn and Silverbrook discloses the basic elements of the claimed invention except for a nozzle density greater than 10000 nozzles/cm².

Fein et al. teaches in [Col. 2, Lines 1-14] a nozzle packing density of at least 100 nozzles/mm², which is equal to 10000 nozzles/cm² when converted to square centimeters.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the nozzle density of Feinn et al. to the printhead of Kubby in view of Dunn and Silverbrook for the purpose of accommodating higher printing resolutions and to improve the printhead drop generation rate in [Col. 1, Lines 57-61].

11. Claims 6, 25, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Watrobski et al. (US Pat. 5,742,307).

Kubby in view of Dunn and Silverbrook discloses the basic elements of the claimed invention except for the printhead being configured to print on a page and to be a page-width printhead.

Watrobski et al. teaches in [Col. 4, Lines 54-59] and [Col. 5, Lines 1-3] a page-width printer having a length equal to or greater than the width of a sheet of paper [14] and consisting of page-width printbars [12] made of an array of individual printhead subunits [18] shown in Fig. 11.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the page-width printing capability of Watrobski et al. to the printhead of Kubby in view of Dunn and Silverbrook for the

purpose of continually moving a medium past a printhead as opposed to stepping the medium past a reciprocating printhead after a printed swath is completed.

12. Claims 8, 13, 27, 32, 44, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Silverbrook (US Pat. 5,841,452).

Kubby in view of Dunn and Silverbrook ('836) disclose the basic elements of the claimed invention except for the heater element configured such that an actuation energy of less than 500 nanojoules is required to heat the heater element sufficiently to form a bubble to cause the ejection of a drop and except for a structure incorporating nozzles formed by chemical vapor deposition (CVD).

Silverbrook ('452) teaches that typically 200 nanojoules is required to eject a drop by heating the heater element in [Col. 18, Lines 15-18]. Silverbrook ('452) teaches a thick chemical vapor deposition (CVD) glass over coat [142] which forms the nozzle region in [Col. 9, Lines 57-58] shown in Fig. 12.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the requirement of applying a typical heating energy of 200 nanojoules and a nozzle plate formed by chemical vapor deposition (CVD) to the heating element and printhead of the Kubby in view of Dunn and Silverbrook ('836) printhead for the purpose of maintaining print speed while

reducing power dissipation and to provide mechanical strength to resist the shock of exploding or collapsing vapor bubbles and to provide protection against the external environment in [Col. 8, Lines 22-25].

13. Claims 12, 31, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Mitani et al. (US Pat. 5,831,648).

Kubby in view of Dunn and Silverbrook discloses the basic elements of the claimed invention except the bubble formed by the heating element is collapsed at a space away from the heating element.

Mitani et al. teaches a bubble collapsing at a position which is distant from the point where the bubble nucleates in [Col. 16, Lines 61-67] shown in Fig. 17D.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teaching of Mitani et al. with the printhead of Kubby in view of Dunn and Silverbrook for the purpose of causing the ink to flow towards the orifice.

14. Claims 14, 33, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26,

28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Kashino et al. (US Pat. 5,534,898).

Kubby in view of Dunn and Silverbrook disclose the basic elements of the claimed invention except for a nozzle plate of the printhead having a thickness of less than 10 microns.

Kashino et al. teaches a thickness of an orifice plate in the order of several microns in [Col. 6, Lines 34-41].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the thickness of the Kashino nozzle plate to the Kubby in view of Dunn and Silverbrook printhead for the purpose of obtaining adequate values of the velocity of the discharged ink droplets, amount of ink droplet and refilling frequency, and in consideration of the distance between the thermal energy generating element and the discharge port.

15. Claims 15, 34, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of of Komuro (US Pat. 4,965,594).

Kubby in view of Dunn and Silverbrook discloses the basic elements of the claimed invention except for a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each

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chamber, the heater elements within each chamber being formed on different respective layers to one another.

Komuro teaches heating resistors [11A, 21, and 31] of a first, second, and third layer formed on different respective layers and a plurality of nozzles [2] having chambers [4] with heaters [11A, 21, and 31] disposed within in [Cols. 3 and 4, Lines 25-68 and 1-34] shown in Figs. 1-4.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate stated structure of Komuro with the printhead of Kubby in view of Dunn and Silverbrook for the purpose of keeping discharge speed and frequency characteristics in a stable manner.

16. Claims 16, 35, and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Chan (US Pat. 5,710,070).

Kubby in view of Dunn and Silverbrook discloses the basic elements of the claimed invention except for a heater element formed of solid material of which more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

Chan teaches a thermal inkjet printhead comprising a resistive layer composed of titanium-nitride, which forms a resistor and a contact metal barrier layer in [Col. 2, Lines 10-14]. Titanium has an atomic number less than 50 on the periodic table.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the titanium-nitride resistor to the printhead of Kubby in view of Dunn and Silverbrook for the purpose of having resistors that are more reliable, especially at higher temperatures and less complicated to manufacture.

17. Claims 17, 36, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubby (US Pat. 5,706,041) in view of Dunn (US Pat. 4,982,199) and Silverbrook (US Pat. 5,856,836) as applied to claims 1-3, 5, 7, 9, 11, 18-21, 23, 24, 26, 28, 30, 37, 38, 40-42, 45, 47, and 54 above, and further in view of Pan et al. (US Pat. 4,931,813).

Kubby in view of Dunn and Silverbrook discloses the basic elements of the claimed invention except for the heater element configured to a mass of less than 10 nanograms.

Pan et al. discloses the heater element including a solid that is heated to form a bubble vapor to cause ejection of an ink drop, but does not explicitly teach the solid having a mass less than 10 nanograms. It would have been obvious at the time the invention was made to a person having ordinary skill in the art at the time the invention was made to apply less than 10 nanograms of the solid material to the heater element of Kubby in view of Dunn and Silverbrook to cause an ejection of an ink drop since it

has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ (CCPA 1980).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art references (US Pat. 6,488,364) cited in PTO 892 form show elements that are deemed to be relevant to the present invention. These references should be reviewed. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Han S. Choi whose telephone number is (571) 272-8350. The examiner can normally be reached on Monday - Friday, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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PRIMARY EXAMINER